



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/526,999

03/07/2005

Yuichiro Sasaki

NGB-8675US

9408

23122

7590

12/28/2007

RATNERPRESTIA

P O BOX 980

VALLEY FORGE, PA 19482-0980

EXAMINER

SARKAR, ASOK K

ART UNIT

PAPER NUMBER

2891

MAIL DATE

DELIVERY MODE

12/28/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/526,999

Applicant(s)

SASAKI ET AL.

Examiner

Asok K. Sarkar

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-14,16,17 and 34-50 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-14,16,17 and 34-50 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 10/19/2007.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 35 and 36 recite the limitation "the plasma is that of a rare argon gas, or a system containing hydrogen and the gas is that of a system containing hydrogen" in line
3. There is insufficient antecedent basis for these limitations in the claims.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 4 – 6, 10 – 13, 14, 16, 17, 34, 37 – 39, 43 – 47, 49 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno, US 5,851,906 in view of Hymes, US 6,324,715.

Regarding claims 1, 4 and 5, Mizuno teaches a method of introducing impurity; wherein,

- in the course of introducing a material to a solid substance (see the Title) which has an oxidized film or other film sticking on the surface, the oxidized film and other film are first removed as the surface treatment to the solid substance in column 1, lines 15 – 20 and in column 3, lines 47 – 67, and
- then a certain desired particle is attached or introduced in column 4, lines 4 – 23.

Mizuno fails to teach a means for dipping the surface of solid substance in a reductive liquid, and the reductive liquid is at least one liquid selected from the group consisting of hydrogen fluoride, sodium hydroxide, aqueous ammonia, sulfinic acid and adipic acid di-2-ethylhexyl ester. and the means for dipping the surface of solid substance in a reductive liquid rubs the surface of solid substance mechanically when it is dipped in the reductive liquid.

Hymes teaches an apparatus for cleaning the surface of a silicon wafer by applying a scrubbing action on both sides of the wafer (see column 4, lines 20 – 22) with a liquid containing aqueous ammonia and hydrogen fluoride in column 5, lines 10 – 20 and throughout the disclosure for the benefit of converting the hydrophobic surface to a hydrophilic surface in column 2, lines 34 – 42.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Mizuno and clean the surface of a silicon wafer by scrubbing with a liquid containing aqueous ammonia and hydrogen fluoride for the benefit of converting the hydrophobic surface to a hydrophilic surface as taught by Hymes in column 2, lines 34 – 42.

It would have been obvious also to one with ordinary skill in the art at the time of the invention that although Hymes fails to explicitly teach dipping the surface in the liquid, however, the double sided scrubbing taught by Hymes is equivalent to dipping since the wafer will be surrounded and covered on both sides by the liquid coming out of the brush thereby aiding in the removal of the native oxide.

Regarding claim 6, Mizuno teaches the certain desired particle is attached or introduced by bringing a gas containing the certain desired particle to make contact to the surface of solid substance which surface has been made to be free of the oxidized film and other film, thereby the particle is attached or introduced to the surface, or the vicinity, of solid substance as was described earlier in rejecting claim 1 and in column 4, lines 4 – 23.

Regarding claim 10, Mizuno teaches the attaching or introducing of a certain desired particle is conducted in an environment in which the temperature of solid substance is lower than 600 °C in column 4, lines 22 – 23.

Regarding claim 11, Mizuno in view of Hymes teaches a method of introducing impurity; wherein, in the course of introducing a material in the phase of ion, plasma, gas, etc. to a solid substance which has an oxidized film or other film sticking to the surface, the oxidized film and other film are first removed as the surface treatment to solid substance a means for dipping the surface of solid substance in a reductive liquid, and then a certain desired particle is attached or introduced as was described earlier in rejecting claim 1.

Regarding claim 12, Mizuno teaches the certain desired particle is attached or introduced while it is in the state of gas in column 4, lines 10 – 15.

Regarding claims 13, 16 and 49 Mizuno teaches at least one facility selected from among each of the following respective categories is used; at least one apparatus selected from among the group consisting of an apparatus for irradiating the surface of solid substance with plasma, an apparatus for irradiating the surface of solid substance with gas and an apparatus for dipping the surface of solid substance in a reductive liquid; an apparatus for bringing a gas containing a certain desired particle to the surface of solid substance; and an annealing apparatus for diffusing the certain desired particle attached or introduced therein with reference to Fig. 1 and in between column 3, line 34 and column 4, line 56.

Regarding claims 14, 37, 38 and 47, the limitations have been described earlier in rejecting claims 4 and 5.

Regarding claims 17 and 50, Mizuno in view of Hymes teaches the limitations of the claim as were described earlier in rejecting claims 1 and 11.

Regarding claims 34, Mizuno in view of Hymes teaches the limitations of the claims as were described earlier in rejecting claim 1.

Regarding claim 39, Mizuno in view of Hymes teaches the limitations of the claim as were described earlier in rejecting claims 11 and 13.

Regarding claim 43, Mizuno in view of Hymes teaches the limitations of the claim as were described earlier in rejecting claim 10.

Regarding claims 44 – 46, Mizuno in view of Hymes teaches the limitations of the claims as were described earlier in rejecting claims 11 – 13.

7. Claims 7 – 9, 40 – 42 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno, US 5,851,906 in view of Hymes, US 6,324,715 as applied to claims 1 and 34 above, and further in view of NTT Corp., JP 07094427 (English Abstract and Translation).

Regarding claims 7, 40 and 48, Mizuno in view of Hymes fails to teach the method of attaching or introducing a certain desired particle is irradiating the surface of solid substance, which surface has been made to be free of the oxidized film and other film, with electromagnetic wave whose energy is matching the energy that is binding the hydrogen or hydroxyl radical sticking on the surface with the atom of solid substance, thereby converting the binding into a non – coupled state, separating the sticking

hydrogen or hydroxyl radical, and exposing the atom constituting solid substance to the surface; and then introducing the certain desired particle for making contact so that the particle is attached or introduced to the surface, or the vicinity, of solid substance.

NTT Corp teaches a method of doping in which the surface of solid substance is irradiated with an electromagnetic wave at an energy that is more than the ionization energy of the doping gas (see the English Abstract). This energy should be sufficient to separate the sticking hydrogen or hydroxyl radical from the oxide removal process, and expose the atom constituting solid substance to the surface so that the particle is attached or introduced to the surface, or the vicinity, of solid substance after making the contact with the surface for the benefit of doping at low temperature of 400 °C or less (see the Advantage in the English Abstract, also paragraph 9 of the English translation).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Mizuno in view of Hymes and irradiate the surface of solid substance, which surface has been made to be free of the oxidized film and other film, with electromagnetic wave whose energy matches the energy that is binding the hydrogen or hydroxyl radical sticking on the surface with the atom of solid substance, thereby converting the binding into a non – coupled state, separating the sticking hydrogen or hydroxyl radical, and exposing the atom constituting solid substance to the surface; and then introducing the certain desired particle for making contact so that the particle is attached or introduced to the surface, or the vicinity, of solid substance for the benefit of doping at low temperature of 400 °C or less as taught by NTT Corp in the Advantage portion of the English Abstract and in paragraph 9 of the English translation.

Regarding claims 8, 9, 41 and 42, Mizuno in view of Hymes fails to teach the energy of irradiating electromagnetic wave is between 318 kJ/mol and 666 kJ/mol.

However, it would have been obvious to one with ordinary skill in the art at the time of the invention to judiciously adjust and control these parameters during the doping process of the NTT Corp. through routine experimentation and optimization to achieve optimum benefits (see MPEP 2144.05) and it would not yield any unexpected results.

Note that the specification contains no disclosure of either the critical nature of the claimed processes or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen methods or upon another variable recited in a claim, the Applicant must show that the chosen methods or variables are critical (*Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir., 1990)). See also *In re Aller, Lacey and Hall* (10 USPQ 233 – 237).

Response to Arguments

8. Applicant's arguments filed November 8, 2007 have been fully considered but they are not persuasive.

The main argument is regarding the Hymes reference, which the Applicant alleges, does not teach "dipping in the cleaning solution". This argument is not persuasive as has been explained above during the rejection. Hymes process rubs the two surfaces of the solid substance (wafer) with a solution soaked scrubber which will in effect douse the wafer with the cleaning solution. The process along with the scrubbing (which Applicant's claim 5 also does) will efficiently react the HF solution with the oxide

and will subsequently clean the wafer in the cleaning process. In the process, the wafer surface is rendered hydrophilic. Additionally, the specification contains no disclosure of either the critical nature of the claimed processes or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen methods or upon another variable recited in a claim, the Applicant must show that the chosen methods or variables are critical (*Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir., 1990)). See also *In re Aller, Lacey and Hall* (10 USPQ 233 – 237).

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

10. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William B. Baumeister can be reached on 571 272 1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

12. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Asok Kumar Sarkar
Asok K. Sarkar
December 19, 2007

Primary Examiner